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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

MANDALA, VICTOR A

ART UNIT PAPER NUMBER

2826

DATE MAILED: 03/20/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/944,903

Applicant(s)

DERRAA ET AL.

Examiner

Victor A Mandala Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Response to Amendment

1. The Applicant has amended the independent claims 1 and 10 to overcome the 35 U.S.C. 102(b) rejection, which was anticipated by Derderian et al. The examiner has reviewed the amendments and the claims will be further examined below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3, 5, 8-10, and 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,773,363 Derderian et al.

2. Referring to claim 1, an integrated circuit, comprising: a silicon substrate, (Figure 2 #32); an insulating layer, (Figure 2 #36), formed on an upper surface of the substrate, (Figure 2 #32), wherein a contact opening is formed in the insulating layer, (Figure 2 #36), wherein the contact opening extends from an upper surface of the insulating layer, (Figure 2 #36), to the upper surface of the substrate, (Figure 2 #32); a conductive contact deposited in the opening in a manner such that the conductive contact, (Figure 2 #41), directly contacts the upper surface of the substrate, (Figure 2 #32), wherein the conductive contact, (Figure 2 #41), comprises a titanium layer, (Col. 5 Line 30), interspersed with titanium silicide, (Col. 1 Lines 53-60), **where in a substantial portion of the titanium silicide is interspersed in the titanium prior to**

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depositing in the opening, (See ** below); a conductive contact fill, (Figure 2 #42), deposited on an upper surface of the conductive contact, (Figure 2 #41), in a manner such that the contact fill, (Figure 2 #42), fills substantially the entire contact opening, wherein the contact fill, (Figure 2 #42), comprises titanium nitride, (Col. 5 Lines 34-35).

****** Initially, and with respect to claims 1 and 10, note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases as the above case law makes clear.

As to the grounds of rejection under section 103, see MPEP § 2113

The amendment filed on 1-10-03 has added limitations that involve the process of making the device, which the limitations do not show a substantial difference in the structural integrity between the prior art, (Derderian et al.), and the Applicants claimed language.

3. Referring to claim 3, an integrated circuit, wherein the titanium layer interspersed with titanium silicide comprises approximately 10 % silicon.

Derderian et al. teaches the claimed invention in claim 3 except for the exact measurements of amount of Silicon that was diffused with the titanium layer.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

4. Referring to claim 5, an integrated circuit, wherein the upper surface of the substrate, (Figure 2 #32), comprises a junction region, (Figure 2 #34 and Figure 1 #16 & Col. 3 Line 14).

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5. Referring to claim 8, an integrated circuit, wherein the titanium rich titanium silicide layer is deposited over the upper surface of the insulating layer.

Derderian et al. teaches the claimed invention in claim 3 except for the exact measurements of amount of Silicon that was diffused with the titanium layer.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

6. Referring to claim 10, a contact structure having a contact opening formed over a junction region, (Figure 2 #34 and Figure 1 #16 & Col. 3 Line 14), in a silicon substrate, (Figure 2 #32), comprising: a conductive contact layer, (Figure 2 #41), comprising titanium, (Col. 5 Line 30), interspersed with titanium silicide, (Col. 1 Lines 53-60), wherein the conductive contact layer, (Figure 2 #41), is deposited directly on an upper surface of the silicon substrate, (Figure 2 #32), over the junction region, (Figure 2 #34), wherein the titanium silicide in the conductive contact layer, (Figure 2 #41), reduces consumption of silicon from the junction region, (Figure 2 #34), **wherein a substantial portion of the titanium silicide is interspersed in the titanium before the conductive contact layer is deposited in the opening, (See ** above);** during a silicidation reaction between silicon in the substrate and titanium in the conductive contact layer, (Figure 2 #41 and Col. 1 Lines 53-60); a diffusion barrier layer, (Figure 2 #42 & Col. 1 Lines 8-10 & Col. 5 Lines 34-35), formed on an upper surface of the conductive contact layer, (Figure 2 #41); a contact fill, (Figure 1 #42), formed on an upper surface of the diffusion barrier layer, (Figure 2 #42 & Col. 1 Lines 8-10 & Col. 5 Lines 34-35), wherein the contact fill comprises titanium

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nitride, (Figure 2 #42 & Col. 1 Lines 8-10 & Col. 5 Lines 34-35), wherein the titanium nitride fills substantially the entire contact opening.

7. Referring to claim 12, a contact structure, wherein the diffusion barrier layer comprises titanium nitride, (Figure 2 #42 & Col. 1 Lines 8-10 & Col. 5 Lines 34-35).

8. Claims 9, and 13-18 are product by process claims and the applicant elected for the device filed on 8-23-02.

Initially, and with respect to claims 9, and 13-18, note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases as the above case law makes clear.

As to the grounds of rejection under section 103, see MPEP § 2113

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 6, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,773,363 Derderian et al. in view of U.S. Patent No. 5,963,832 Srinivasan et al.

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9. Referring to claim 2, an integrated circuit, wherein the titanium layer interspersed with titanium silicide is approximately 50A to 150A thick.

Derderian et al. teaches the claimed invention in claim 2 except for the exact measurements of the titanium and titanium silicide layer, but Srinivasan et al. does in Col. 6 Lines 26-35 with a similar invention to Derderian et al.'s.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

10. Referring to claim 6, an integrated circuit, wherein the junction region is less than about 1 μm deep.

Derderian et al. teaches the claimed invention in claim 6 except for the exact measurements of the junction region, but Srinivasan et al. does in Col. 6 Lines 26-35 with a similar invention to Derderian et al.'s.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

11. Referring to claim 11, a contact structure, wherein the junction region is less than about 1 μm deep.

Derderian et al. teaches the claimed invention in claim 11 except for the exact measurements of the junction region, but Srinivasan et al. does in Col. 6 Lines 26-35 with a similar invention to Derderian et al.'s.

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Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,773,363 Derderian et al. in view of U.S. Patent No. 6,333,547 Tanaka et al.

12. Referring to claim 4, an integrated circuit, wherein the contact opening has an aspect ratio of at least 10:1.

Derderian et al. teaches the claimed invention in claim 11 except for the aspect ratio, but Tanaka et al. does in Col. 10 Lines 42-44 with a similar invention to Derderian et al.'s.

Note that the specification contains no disclosure of either the critical nature of the claimed dimensions or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,773,363 Derderian et al. in view of U.S. Patent No. 5,756,394 Manning.

13. Referring to claim 7, an integrated circuit, wherein the titanium silicide in the titanium layer provides low resistance electrical contacts between the junction region and the silicon substrate.

Derderian et al. teaches the claimed invention in claim 7, but does not give an explanation of why and how the titanium silicide contact with the silicon substrate is a benefit in the design as claimed in claim 7. Derderian et al. does have all the physical elements so it would be obvious to one skilled in the art to know that the connection provides a low resistance contact. A published explanation can be found in Manning's teachings

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor A Mandala Jr. whose telephone number is (703) 308-6560. The examiner can normally be reached on Monday through Thursday from 8am till 6pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

VAMJ
March 11, 2003

NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800